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A New Harpacticoid Copepod from a Sandy Beach  
of Lake Biwa

*With 15 Text-figures*

Yoshifumi MIURA

*Kakogawa Nishi High School, Kakogawa-shi, Hyogo-ken*  
(Communicated by M. UENO)

**ABSTRACT** Having investigated the fauna of the sandy beach of Lake Biwa in August and October, 1967, the writer found many harpacticoids which seem to be a new species belonging to the genus *Parastenocaris*. This new species is closely related to *Parastenocaris starretti* Pennak, but is distinguishable from it in the following characteristics: 1, the features of the fourth endopodite, and chitinous protuberances present at its base in the male; 2, the structure of the male leg 3 and 3, an anal operculum bearing a hyaline membrane in both sexes.

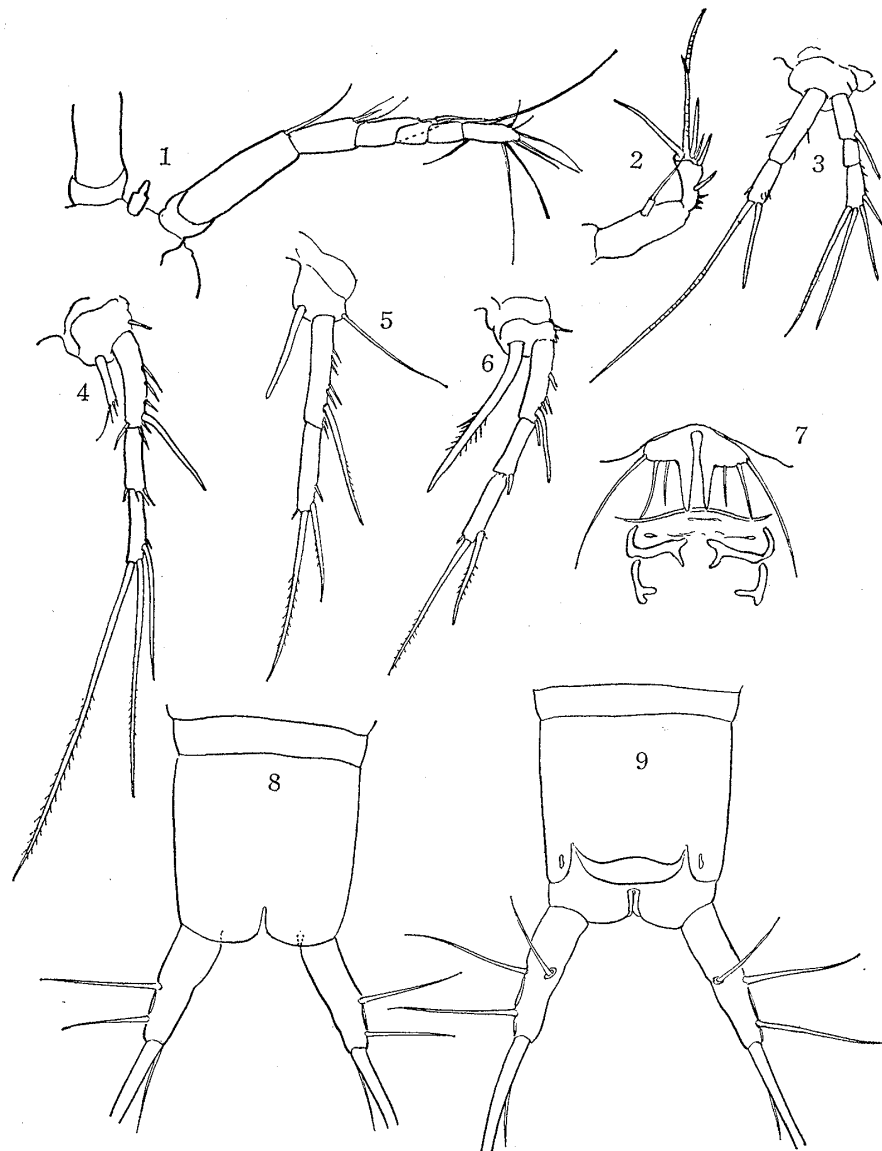
*Parastenocaris biwae* inhabits the sandy beach at Shirahige, extending between 25 cm and 100 cm from the edge of the water. Almost all the specimens, making up 92 percent of the total, were found at the station 25 cm distant from the water. In striking contrast to this, no specimen was obtained in the submerged sand just below the edge of the water. The great majority of the specimens were obtained in the sand to a depth of 6 cm. The total populations in the same beach vary according to the different months.

The micrometazoan fauna of freshwater beaches has been investigated in such countries as Poland, Hungary, Germany and the United States. In the last-named country, Pennak (1939, 1951) who studied the fauna of the beaches of about thirty lakes, found three species of harpacticoid copepods. Having investigated the sandy beach fauna of Lake Biwa in August and October, 1967, the writer found a harpacticoid which seems to be *a new species* belonging to the genus *Parastenocaris*. Its description will be given in the present paper, with some ecological notes concerning it.

*Parastenocaris biwae* sp. n.

*Female:* Length 0.45 mm–0.48 mm excluding furcal setae. Body cylindrical and vermiform, about eight times as long as wide, tapering a little posteriorly. Thorax

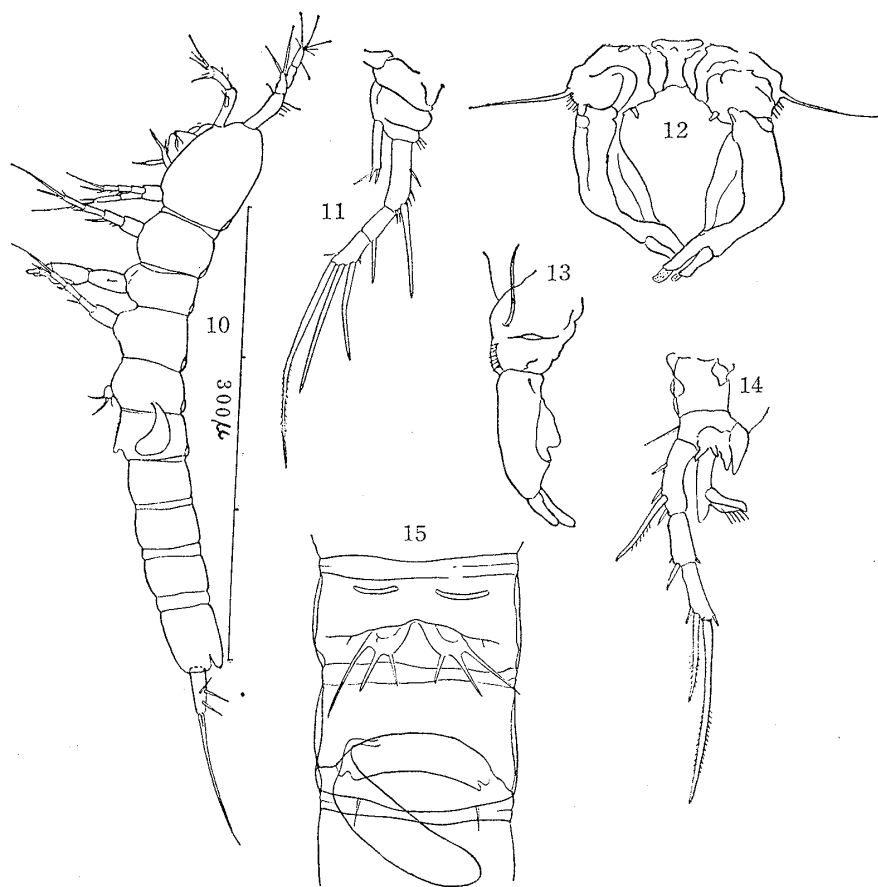
and abdomen, transparent and colourless. Rostrum small, triangular and pointed. Hind margins of abdominal segments smooth on both ventral and dorsal surfaces. Metasome longer than urosome. Anal segment about 1.5 times as long as wide. Anal operculum concave, with transparent membrane on posterior part. Caudal rami divergent, slender, and shorter than anal segment, about 4.5 times as long as width; with two setae at middle, one dorsal and one lateral, and one more subapical lateral seta; longer one of two apical setae about 4 times as long as caudal rami.



Figs. 1-9. *Parastenocaris biwae* sp. n., of Shirahige Beach, Lake Biwa. Fig. 1. first antenna and rostrum. Fig. 2. second antenna. Fig. 3. ♀ leg 1. Fig. 4. ♀ leg 2. Fig. 5. ♀ leg 3. Fig. 6. ♀ leg 4. Fig. 7. leg 5 and receptaculum seminis. Fig. 8. ♀ anal segment and furcal rami, ventral view. Fig. 9. anal operculum and furcal rami, dorsal view.

First antenna consists of 7 segments; second segment the longest. Second antenna two-segmented, with very small exopodite, one-segmented, tipped with one long seta. Mouth parts are as described by Lang (1948) for the genus.

Leg 1, exopodite 3-segmented; middle segment without seta; terminal segment with 4 apical setae of different lengths. Leg 1, endopodite as long as exopodite, 2-segmented, first segment longer than second; first segment without seta and end segment with two apical setae. Exopodites of leg 2 and leg 4 composed of three segments, middle segment without outer seta. Exopodite of leg 3 consists of two segments. Distal exopodite segment of leg 2 bears 3 setae; those of leg 3 and leg 4 bear two setae each. Endopodite of leg 2 one-segmented, with 4 apical hairs, one of which is half as long as endopodite. Endopodite of leg 3 blunt, spiniform, and slightly shorter than first exopodite segment. Endopodite of leg 4 rod-like in form, extending to middle of third exopodite segment. Leg 5 consists of three elements, viz., an outer basal process, two setae, and an inner broad unarmed expansion. Receptaculum seminis as shown in Fig. 7.



Figs. 10-15. *Parastenocaris biwae* sp. n., of Shirahige Beach, Lake Biwa. Fig. 10. lateral view of male. Fig. 11. ♂ leg 2. Fig. 12. ♂ leg 3. Fig. 13. ♂ leg 3, lateral view. Fig. 14. ♂ leg 4. Fig. 15. leg 5 and spermatophore.

*Male:* Length 0.40 mm–0.45 mm. Body is similar to that of female in general appearance, but sexual modifications are seen in the first antenna and leg 3 – leg 5. First antenna very strong, becoming a grasping organ; fifth and sixth segments much reduced and against fourth segment. Leg 1, leg 2 and exopodite of leg 4 similar to those of the female. Leg 3 greatly modified. Protopodite with a long seta on distal part; exopodite 2-segmented, first segment bearing a row of fine spinules on distal part, second segment stout, curved inward, with two finger-like distal processes, each of which bears a small hyaline membrane at its tip. Leg 3, endopodite degenerate. Leg 4, endopodite one-segmented, strongly modified, extending beyond distal end of first segment of exopodite, and bearing a scale-like lamella fringed with 5 hairs. At the base of endopodite there are present two chitinous protuberances, one of which is forked into two branches. Leg 5 small and lobe-shaped, with 3 setae, the outermost of which is longest. Leg 6 lamellar.

*Type-specimens:* Holotype, female; allotype, male; paratypes, male and female. (9–VIII–1967, collected by Y. Miura)

*Type-locality:* Sandy beach, at Shirahige on the western shore of Lake Biwa.

This new species is closely allied to *Parastenocaris starretti* Pennak which was found in the sandy beach of Starrett Lake in Wisconsin, but is distinguishable from that by the structure of the fourth endopodite which has chitinous protuberances at its base in the male, as well as by the structure of the anal operculum in both sexes.

#### ECOLOGICAL NOTE

Shirahige Beach is located on the western shore of the central part of Lake Biwa. The beach is narrow, about 13 meters wide, because of the mountain close to the lake. The sand of the beach is clean and provides suitable habitat for *Parastenocaris* and other microcrustaceans. The presence of clay on the beach prevents a rich development of the micrometazoan fauna, because the spaces between the sand grains become more or less filled with minute but heavy clay particles. Four sand samples, each 2 cm in thickness, were taken at successive stations between the surface of the sand and a depth of 10 cm. These samples were then washed with water. A quantity of the water thus obtained was passed through a fine mesh sieve and the residue was examined. Many microscopic animals were found in it, such as *Parastenocaris*, *Bryocamptus*, Ostracoda, Acari, Oligochaeta and Nematoda. *Parastenocaris biwae* were found in the sand horizontally extending between 25 cm and 100 cm from the edge of the water. Almost all the specimens obtained, 92 percent of the total, were found at the station 25 cm distant from the water, and 5.6 percent being at the distance of 50 cm. No specimens were found in the submerged sands adjacent to the beach or directly under the water. They were most abundant at a vertical depth in the sand of 6 cm, making up 82 percent of all the specimens found. The population totals vary according to the month. On August 9, 1967, 165 specimens in total were found in 30 samples, while on October 15, two months later, only 16

Table 1.  
Depth distribution of individual numbers of  
*Parastenocaris biwae* in sand samples (40 cm<sup>3</sup>) from Lake Biwa. At each station,  
five samples, each 2 cm in thickness, were taken successively to a depth of 10 cm. 9 Aug.  
and 15 Oct. 1967; figures in parentheses denote the data of October.

Depth of sample, cm	Distance from water edge, cm					
	0	25	50	75	100	125
0-2	0 (0)	26 (0)	1 (0)	0 (0)	0 (0)	0 (0)
3-4	0 (0)	18 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5-6	0 (0)	84 (3)	9 (3)	2 (0)	1 (0)	0 (0)
7-8	0 (0)	9 (4)	0 (0)	0 (0)	0 (1)	0 (0)
9-10	0 (0)	2 (4)	0 (0)	0 (0)	0 (0)	0 (0)
Total	0 (0)	139 (11)	10 (3)	2 (0)	1 (1)	0 (0)

specimens were obtained in the same place.

#### ACKNOWLEDGEMENT

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